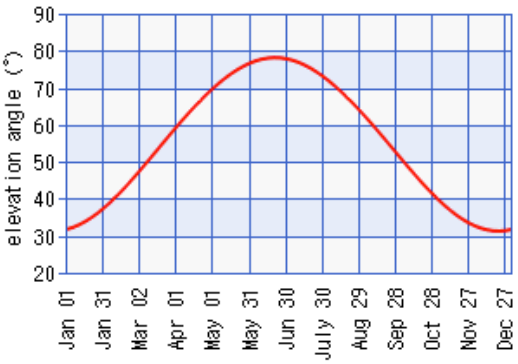
I can check the solar elevation angle with this website, knowing that our latitude is ~ 35.3 degrees. I can see that for today, the max angle is about 56 degrees, so I inclined the solar panel accordingly.

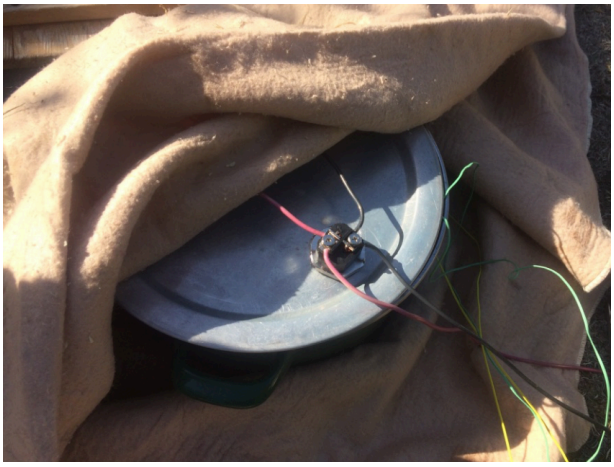


I purchased two different kinds of heaters. The one I used on this experiment is chrome plated, so we probably shouldn't use it for food. The other one claims to be copper with a silver finish… likely also chrome plated. I should probably buy these for $29, but they are SS, or some others from the same website.

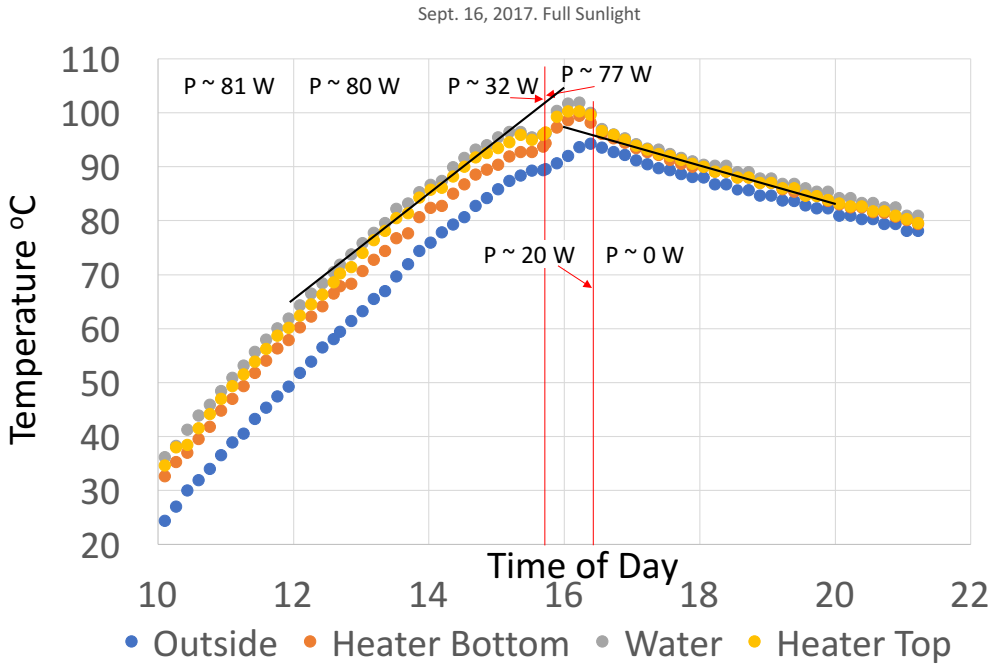
The power was about 80W, but by 3:40, it had dropped to about 33 W because the sun had moved so much. I realigned the panel and the power returned to almost 80W. It seems for optimum power, the resistance is a little too high.

I could buy these for $9. Made out of copper. Really, we need to make our own.

The heaters were wired in parallel as shown at right. I attached thermocouples to the outside of the pot (with tape, see at right), inserted one in the water, and tied one onto the top of the heater (above the water line) and the bottom of the heater as shown below, left. The water line was about the same point where the conductive lead of the heater was connected to the resistive heating element inside. I determined this by running current through the heater and feeling where it got hot. I wrapped the pot assembly in blankets and put it in a cooler as shown in the pictures at right and below.







The temperature data are above. Strangely, the water temperature is higher than that of the heaters, but is warmer than the heaters while cooling. Potentially, this TC reads a little higher than the others. I didn't get a constant measurement of power, but measured it periodically, so I'm not sure exactly what it was all the time. It dropped round 15:30 PM as the sun shifted, so I realigned the panel. A shadow fell on the panel around 16:20, so I turned the panel off. We can estimate power by the rate of change of temperature. At 90 ^{o}C, the temperature goes up at about 10 ^{o}C per hour, and without power, decreases at 3.5 ^{o}C per hour, corresponding to 46.7 W absorbed heat, and 16.3 W heat loss rate, corresponding to only a total of 63 W, so at this temperature, it's possible that the sunlight was no longer optimized. The heating efficiency then at 90 ^{o}C with 63 W was about 74%. However, when I take the slope of the heating line from the beginning at room temperature, when one would presume there are no thermal losses, at 14 ^{o}C, we get about 66.5 W. So we might wonder where the other 15 W is going

because we calculated electrical input power of ~ 80 W. The pot itself has considerable mass, but considering the low specific heat of steel, this could explain only about 5 W… so we're pretty close.

Order Details

Ordered on September 4, 2017 Order# 113-8758365-0455406 View or Print invoice

Shipping Address
Peter V. Schwartz
1441 IRIS ST
SAN LUIS OBISPO, CA 93401-3034
United States

Payment Method
**** 9921

Order Summary

Item(s) Subtotal:	$44.05
Shipping & Handling:	$0.00
Total before tax:	$44.05
Estimated tax to be collected:	$2.84
Grand Total:	**$46.89**

Transactions

2 SHIPMENTS

Delivered Sep 7, 2017
Your package was delivered.

Track package

Nichrome 80 - 100 ft 26 Gauge AWG Resistance Wire 0.40mm 26g 100'
Sold by: Master Of Clouds
Return eligible through Oct 7, 2017
$7.49
Condition: New
Buy it again

Return item
Leave seller feedback
Leave package feedback
Write a product review
Archive order

Delivered Sep 7, 2017
Your package was delivered.

Track package

2 of Camco 02202/02203 2000W 120V Screw-In Water Heater Element - High Watt Density
CAMCO MANUFACTURING
Sold by: Amazon.com LLC
Return eligible through Oct 7, 2017
$8.84
Condition: New
Buy it again

Return or replace items
Leave package feedback
Write a product review
Archive order

2 of Reliance 9000130-045 2,000 Watt 120 Volt Electric Water Heater Element
Sold by: Amazon.com LLC
Return eligible through Oct 7, 2017
$9.44
Condition: New
Buy it again

Recommended for you based on Nichrome 80 - 100 ft 26 Gauge AWG Resistance Wi...

0 votes

Question: wanna you for my HLT. Does this rust?

Answer: Outside is crome plated it will oxidize and collect mineral deposits the tube is copper. It will not "rust" but it will oxidize.
By Al on March 30, 2016

» See more answers (2)

0 votes

Question: what is the heating element material?

Answer: If your are concerned about heavy rust on the inside of your water heater walls or boiler or what you are using it for, DO NOT BUY. The heating elements from Camco will rust after very first time of use. Instead take a look at the elements being offered by "Brewhardware.com" or "Southern Boy Stills.com".
Best regards... see more
By Asa on January 26, 2015

» See more answers (1)